SPECIFIED GAS EMITTERS REGULATION

ADDITIONAL GUIDANCE ON COGENERATION FACILITIES

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Alberta
ENVIRONMENT

ALBERTANS & CLIMATE CHANGE

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Introduction:

Co-generation is the combined production of heat for use in manufacturing processes and the production of electricity as a by-product. Electricity not used within the plant may be offered to the competitive electricity market.

The following document has been developed to provide additional guidance regarding the treatment of cogeneration facilities under the *Specified Gas Emitters Regulation* (SGER). In particular, this document is intended to provide clarity on how cogeneration will be handled in the baseline establishment process as well as compliance periods to ensure that the associated benefits of cogeneration activities are recognized.

Please use this document collectively with Section 9 of the *Technical Guidance Document for Baseline Emissions Intensity Applications (July 18, 2007)* in developing baseline applications relating cogeneration facilities.

Assumptions:

Cogeneration units effectively use fuel to produce more output per tonne of GHG emitted than stand alone alternatives. Alberta Environment does not want to create disincentive for the cogeneration operators for their efficient use of fuels. The policy is based on the assumption that, during the baseline period, in the absence of the cogeneration, the power producer would have built a Natural Gas Combined Cycle (NGCC) plant to generate electricity, and the heat host would have built an industrial boiler to generate steam.

Based on the above assumption, Alberta Environment has decided to use the following for cogeneration facilities:

1. Electricity generated by a cogeneration facility will have a greenhouse gas emission intensity of 0.418 tonnes / MWh. (The same GHG intensity will be used for the target years also)[1].
2. Only during the baseline years, the boiler of a cogeneration facility generated steam at a thermal efficiency of 80%.

[1] This intensity will be different for facilities that are using biomass as the fuel source.

All the calculations must be based on mass and energy balance principle.

Under this current approach the reduction obligation associated with co-generation will be incorporated in to the thermal portion. This approach, and the overall policy framework for co-generation, will be assessed in the context of appropriateness and continuous improvement as learnings from the overall program are gained.

Stand-alone cogeneration facilities[2]

Standalone cogeneration facilities are those units that derive all their energy outputs from on-site fuel combustion. These units do not have any other external energy inputs. All the thermal and electrical output should be traced down to single source.

Baselines:

Since, greenhouse emissions attributed to only the thermal portion of the cogeneration output are subject to reduction targets, a facility will have a baseline emission intensity calculated using deemed thermal emissions @ 80% boiler efficiency and total thermal output.

Let, Total thermal output by a cogeneration unit in a year = H

Therefore, Deemed input energy attributed to thermal production @ 80% efficiency,

$E_H = H/0.8$

If V is the fuel heating value (HHV)[3], then total fuel required to generate E_H,

$M_H = E_H/V$

Now, if f is the emission factor for the fuel used in the stand-alone boiler, the deemed greenhouse gas emissions attributed to thermal production,

$D_H = f*E_H/V$

$D_H = f*H/(0.8*V)$

Hence, emission intensity for a year = $D_H/H = f/(0.8*V)$

Also,

[2] The calculations assume a natural gas fired cogeneration facility.
[3] High heating value

If E is total electricity production then, deemed greenhouse gas emissions attributed to electricity production

$$D_E = 0.418*E$$

For information purposes, a cogeneration facility operator is also required to submit cogeneration adjustment to ensure that provincial greenhouse gas inventories reflect actual not adjusted emissions in any given year.

Cogeneration adjustment = $D_H + D_E - G_T$

Where, G_T is actual total greenhouse gas emission from the cogeneration facility.

Emission intensities for each year will be calculated and a simple average of the annual intensities will then be calculated to obtain the facility's Baseline Emission Intensity (BEI) that facility must be reported to Alberta Environment.

Compliance period:

The Net Emissions Intensity Limit (NEI Limit) is calculated by multiplying the BEI for a facility by the appropriate reduction target (2-12 % depending on the age of the facility).

Since the net emission intensity limit is the target intensity for the compliance year, total allowed greenhouse gas emissions will be

= [NEI limit]*[Heat output for the compliance year] ---------- (1)

If, GT is total greenhouse gas emission from a cogeneration facility and E is total electricity production, then total emissions attributed to heat production,

= [GT – 0.418*E][4] ---------- (2)

If (1) is greater than (2), a facility can apply for emission performance credits and if (1) is smaller than (2), a facility must submit appropriate compliance options.

Integrated Cogeneration units

The integrated cogeneration facilities are those units that, in addition to their own fuel source, also have other sources contributing to generating thermal or

[4] This intensity will be different for facilities that are using biomass as the fuel source.

electrical output. This source could be combustion at the host site, any exothermic reaction or in some cases import or export of steam from second heat source depending upon demand.

It is very important for the integrated cogeneration facilities to properly attribute all the emissions to that portion of the electricity and/or thermal output that was generated by the primary combustion source. Since only the electricity portion of the GHG emissions have 0% target, it is essential that thermal portion of GHG emissions are calculated as accurately as possible and added to the total GHG emissions of the host facility.

Baselines:

Baseline Emission Intensity should be calculated as described in the *Technical Guidance Document for Baseline Emissions Intensity Applications*, dated July 18, 2007.

Compliance period:

Since the net emission intensity limit is the target intensity for the compliance year, total allowed greenhouse gas emissions will be

= [NEI limit]*[total production from the facility] ---------- (3)

Let, G_{Fac} is equal to the total greenhouse emissions from a facility excluding total emissions G_T from integrated Cogeneration unit.

Therefore, total emission from the facility including cogeneration heat portion,

$= G_{Fac} + G_T - (0.418*E)$ [5] ---------- (4)

If (3) is greater than (4), a facility can apply for emission performance credits and if (3) is smaller than (4), a facility must submit appropriate compliance options.

[5] This intensity will be different for facilities that are using biomass as the fuel source.